



SMD SLR Series Surface Mount PTC Devices

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Description

The SLR series utilizes new conductive filler to achieve super low resistance and maintain thin device profile. This series is available from 0402 to 1210 size with current rating of 0.10A to 7.50A, and is suitable for applications where space or height is at a premium and resettable protection is desired.

Features





- Super low resistance
- High current rating at lower profile
- RoHS compliant and lead-free
- Halogen-free
- Compact design saves board space

Applications



- Battery PCM
- Mobile Internet Device (MID)
- Mobile phones and PDAs
- USB peripherals



Agency Approval and Environmental Compliance

Agency	File Number	Regulation	Standard
	E201431		2011/65/EU
	R50099121		IEC 61249-2-21:2003

Electrical Characteristics

Part Number	I _{hold} (A)	I _{trip} (A)	V _{max} (Vdc)	I _{max} (A)	P _{d typ} (W)	Maximum Time To Trip		Resistance		Agency Approval	
						Current (A)	Time (Sec.)	R _{min} (Ω)	R _{1max} (Ω)		
SMD0402P010SLR	0.10	0.30	6	40	0.5	0.50	1.00	0.150	2.000	✓	✓
SMD0402P020SLR	0.20	0.50	6	40	0.5	1.00	1.00	0.100	1.250	✓	✓
SMD0402P035SLR	0.35	0.70	6	40	0.5	8.00	0.10	0.050	0.700	✓	✓
SMD0402P050SLR	0.50	1.00	6	40	0.5	8.00	0.10	0.040	0.400	✓	✓
SMD0603P075SLR	0.75	1.50	6	50	0.6	8.00	0.20	0.040	0.165	✓	✓
SMD0603P100SLR	1.00	1.80	6	50	0.6	8.00	0.30	0.040	0.120	✓	✓
SMD0603P150SLR	1.50	3.00	6	50	0.6	8.00	0.50	0.007	0.080	✓	✓
SMD0603P175SLR	1.75	3.50	6	50	0.6	8.00	0.60	0.005	0.060	✓	✓
SMD0805P200SLRT	2.00	4.00	6	50	0.6	8.00	1.00	0.005	0.045	✓	✓
SMD0805P260SLRT	2.60	5.20	6	50	0.6	8.00	4.00	0.003	0.035	✓	✓
SMD0805P300SLRT	3.00	6.00	6	50	0.6	8.00	5.00	0.003	0.030	✓	✓
SMD1206P350SLRT	3.50	7.00	6	50	0.8	8.00	5.00	0.003	0.018	✓	✓
SMD1206P400SLR	4.00	8.00	6	50	0.8	20.00	2.00	0.001	0.016	✓	✓
SMD1206P450SLR	4.50	9.00	6	50	0.8	22.50	2.00	0.001	0.014	✓	✓
SMD1206P500SLR	5.00	10.00	6	50	1.0	25.00	2.00	0.001	0.012	✓	✓
SMD1210P550SLR	5.50	11.00	6	50	1.2	27.50	2.00	0.001	0.011	✓	✓
SMD1210P600SLR	6.00	12.00	6	50	1.2	30.00	2.00	0.001	0.010	✓	✓
SMD1210P650SLR	6.50	13.00	6	50	1.2	32.50	2.00	0.001	0.009	✓	✓
SMD1210P700SLR	7.00	14.00	6	50	1.2	35.00	2.00	0.001	0.008	✓	✓
SMD1210P750SLR	7.50	15.00	6	50	1.2	37.50	2.00	0.001	0.007	✓	✓

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Note on Electrical Characteristics

■ Vocabulary

I_{hold} = Hold current: maximum current device will pass without tripping in 23°C still air.

I_{trip} = Trip current: minimum current at which the device will trip in 23 °C still air.

V_{max} = Maximum voltage device can withstand without damage at rated current (I_{max})

I_{max} = Maximum fault current device can withstand without damage at rated voltage (V_{max})

$P_{d\ typ}$ = Typical power dissipated from device when in the tripped state at 23 °C still air.

R_{min} = Minimum resistance of device in initial (un-soldered) state.

R_{1max} = Maximum resistance of device at 23 °C measured one hour after tripping or reflow soldering of 260 °C for 20 sec.

■ **Caution: Operation beyond the specified rating may result in damage and possible arcing and flame.**

■ **Specifications are subject to change without notice.**

Polymeric PTC Selecting Guide

■ Determine the following operating parameters for the circuits:

- Normal operating current (I_{hold})
- Maximum interrupt current (I_{max})
- Maximum circuit voltage (V_{max})
- Normal operating temperature surrounding device (min°C/max°C)

■ Select the device form factor and dimension suitable for the application:

- Surface Mount Device (SMD)
- Axial Leaded Device (ALD)
- Other Customized Form Factors
- Radial Leaded Device (RLD)
- DISC Device

■ **Compare the maximum rating for V_{max} and I_{max} of the PPTC device with the circuit in application and make sure the circuit's requirement does not exceed the device rating.**

■ **Check that PPTC device's trip time (time-to-trip) will protect the circuit.**

■ **Verify that the circuit operating temperature is within the PPTC device's normal operating temperature range.**

■ **Verify the performance and suitability of the chosen PPTC device in the application.**

WARNING

■ Mechanical Stress

- PPTC devices will undergo a thermal expansion during fault condition. If PPTC devices are installed or placed in an application where the space between PPTC devices and the surrounding materials (e.g., covering materials, packaging materials, encapsulate materials and the like) is insufficient, it will cause an inhibiting effect upon the thermal expansion. Pressing, twisting, bending and other kinds of mechanical stress will also adversely affect the performance of the PPTC devices, and shall not be used or applied.

■ Chemical Pollutants

- Silicone-based oils, oils, solvents, gels, electrolytes, fuels, acids, and the like will adversely affect the properties of PPTC devices, and shall not be used or applied.

■ Electronic and Thermal Effect

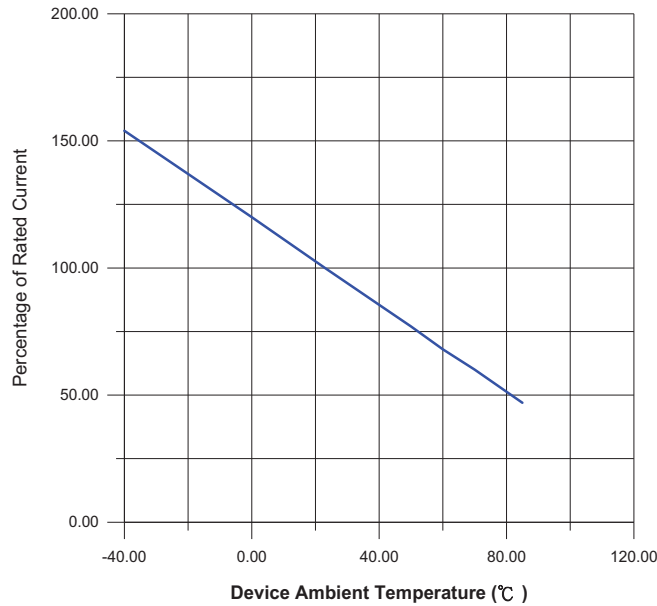
- PPTC devices are secondary protection devices and are used solely for sporadic, accidental over-current or over-temperature error condition, and shall NOT be used if or when constant or repeated fault conditions (such fault conditions may be caused by, among others, incorrect pin-connection of a connector) or over-extensive trip events may occur.
- PPTC devices are different from fuses and, when a fault condition occurs, will go into high-resistance state and do not open circuit, in which case the voltage at such PPTC devices may reach a hazardous level.
- Operation over the maximum rating or other forms of improper use may cause failure, arcing, flame and/or other damage to the PPTC devices.
- Conductive material contamination, such as metal particle, may induce shortage, flame or arcing.
- Due to the inductance, the operation circuits may generate a circuit voltage (Ldi/dt) above the rated voltage of PPTC devices, which shall not be used under such circumstances.

■ General

- Customers shall evaluate and test the properties of PPTC devices independently to verify and ensure that their individual applications will be met.
- The performance of PPTC devices will be adversely affected if they are improperly used under electronic, thermal and/or mechanical procedures and/or conditions non-conformant to those recommended by manufacturer.
- Customers shall be responsible for determining whether it is necessary to have back-up, failsafe and/or fool-proof protection to avoid or minimize damage that may result from extra-ordinary, irregular function or failure of PPTC devices.
- Any and all responsibilities and liabilities are disclaimed if any item under this notice of warning is not complied with.
- Polytronics shall not be liable for any claims or damages arising out of products used in automotive applications, unless otherwise agreed by Polytronics.

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Thermal Derating Curve



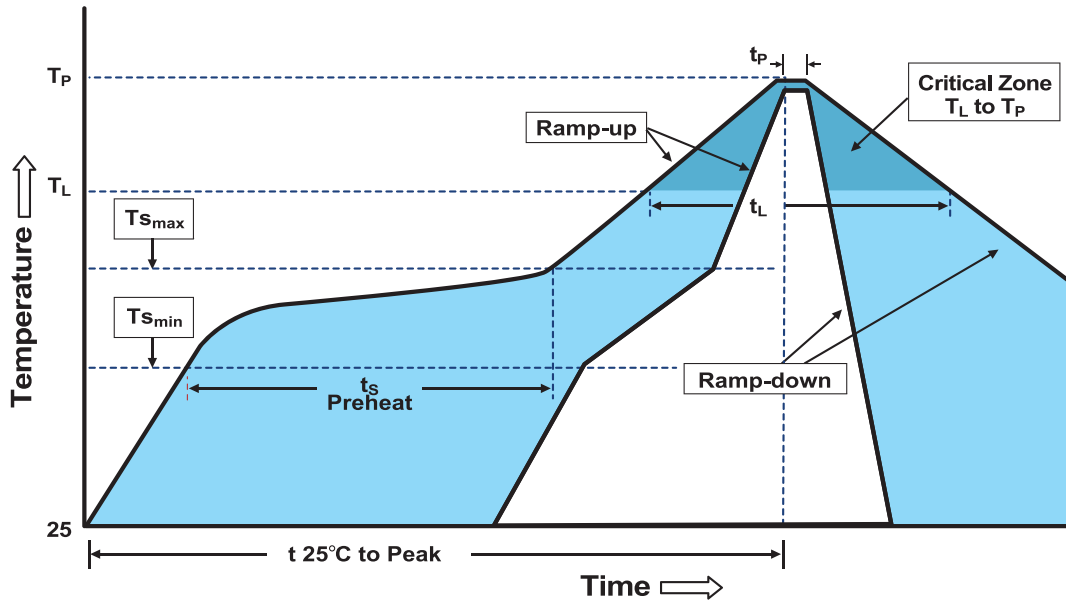
Thermal Derating Chart

Recommended Hold Current (A) at Ambient Temperature (°C)

Part Number	Ambient Operation Temperature								
	-40 °C	-20 °C	0 °C	23 °C	40 °C	50 °C	60 °C	70 °C	85 °C
SMD0402P010SLR	0.14	0.13	0.11	0.10	0.09	0.08	0.07	0.06	0.05
SMD0402P020SLR	0.29	0.26	0.23	0.20	0.18	0.16	0.15	0.13	0.09
SMD0402P035SLR	0.50	0.45	0.40	0.35	0.31	0.28	0.26	0.22	0.16
SMD0402P050SLR	0.71	0.64	0.57	0.50	0.44	0.40	0.37	0.31	0.23
SMD0603P075SLR	1.23	1.08	0.94	0.75	0.61	0.53	0.45	0.36	0.23
SMD0603P100SLR	1.35	1.25	1.10	1.00	0.82	0.74	0.65	0.52	0.35
SMD0603P150SLR	2.40	2.10	1.80	1.50	1.25	1.10	0.95	0.80	0.50
SMD0603P175SLR	2.50	2.25	2.00	1.75	1.55	1.40	1.30	1.10	0.80
SMD0805P200SLRT	3.10	2.75	2.40	2.00	1.65	1.40	1.15	0.95	0.65
SMD0805P260SLRT	3.80	3.30	2.90	2.60	2.20	1.95	1.75	1.50	1.05
SMD0805P300SLRT	4.35	3.80	3.40	3.00	2.50	2.25	2.00	1.70	1.20
SMD1206P350SLRT	5.50	4.85	4.15	3.50	2.85	2.55	2.25	1.90	1.40
SMD1206P400SLR	5.75	5.25	4.65	4.00	3.40	3.05	2.75	2.40	1.65
SMD1206P450SLR	6.50	5.95	5.25	4.50	3.85	3.45	3.10	2.70	1.90
SMD1206P500SLR	7.20	6.60	5.80	5.00	4.25	3.80	3.40	3.00	2.10
SMD1210P550SLR	7.75	6.90	6.25	5.50	4.65	4.15	3.60	3.00	2.30
SMD1210P600SLR	8.45	7.55	6.80	6.00	5.10	4.55	3.95	3.35	2.50
SMD1210P650SLR	9.15	8.15	7.40	6.50	5.50	4.90	4.25	3.60	2.70
SMD1210P700SLR	9.85	8.80	7.95	7.00	5.95	5.30	4.60	3.90	2.90
SMD1210P750SLR	10.25	9.15	8.45	7.50	6.75	6.15	5.55	4.70	3.65

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Soldering Parameters



Profile Feature	Pb-Free Assembly
Average Ramp-Up Rate ($T_{s_{max}}$ to T_P)	3°C/second max.
Preheat	
-Temperature Min ($T_{s_{min}}$)	150°C
-Temperature Max ($T_{s_{max}}$)	200°C
-Time ($T_{s_{min}}$ to $T_{s_{max}}$)	60-180 seconds
Time maintained above:	
-Temperature (T_L)	217°C
-Time (t_L)	60-150 seconds
Peak Temperature (T_P)	260°C
Time within 5°C of actual Peak Temperature (t_P)	20-40 seconds
Ramp-Down Rate	6 °C /second max.
Time 25°C to Peak Temperature	8 minutes max.
Storage Condition	0°C ~35°C, ≤ 70%RH

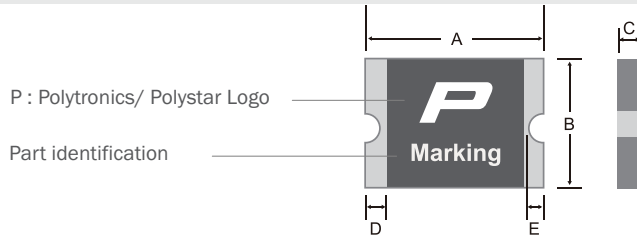
- Recommended reflow methods: IR, vapor phase oven, hot air oven, N₂ environment for lead-free
- Recommended maximum paste thickness is 0.25mm (0.010 inch)
- Devices can be cleaned using standard industry methods and solvents.

Note 1: All temperature refer to topside of the package, measured on the package body surface.

Note 2: If reflow temperatures exceed the recommended profile, devices may not meet the performance requirements.

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Physical Dimensions (mm.)



Part Number	A		B		C		D		E	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
SMD0402P010SLR	0.85	1.15	0.35	0.65	0.20	0.60	0.10	0.45	-	0.40
SMD0402P020SLR	0.85	1.15	0.35	0.65	0.20	0.60	0.10	0.45	-	0.40
SMD0402P035SLR	0.85	1.15	0.35	0.65	0.20	0.60	0.10	0.45	-	0.40
SMD0402P050SLR	0.85	1.15	0.35	0.65	0.20	0.60	0.10	0.45	-	0.40
SMD0603P075SLR	1.40	1.80	0.60	1.00	0.40	0.75	0.15	0.50	-	0.40
SMD0603P100SLR	1.40	1.80	0.60	1.00	0.40	0.75	0.15	0.50	-	0.40
SMD0603P150SLR	1.40	1.80	0.60	1.00	0.40	1.00	0.15	0.50	-	0.40
SMD0603P175SLR	1.40	1.80	0.60	1.00	0.40	1.00	0.15	0.50	-	0.40
SMD0805P200SLRT	2.00	2.20	1.20	1.50	0.40	0.75	0.20	0.55	0.05	0.45
SMD0805P260SLRT	2.00	2.20	1.20	1.50	0.40	0.75	0.20	0.55	0.05	0.45
SMD0805P300SLRT	2.00	2.20	1.20	1.50	0.40	0.75	0.20	0.55	0.05	0.45
SMD1206P350SLRT	3.00	3.40	1.50	1.80	0.40	0.75	0.25	0.75	0.05	0.45
SMD1206P400SLR	3.00	3.40	1.50	1.80	0.60	1.00	0.25	0.75	0.05	0.45
SMD1206P450SLR	3.00	3.40	1.50	1.80	0.60	1.00	0.25	0.75	0.05	0.45
SMD1206P500SLR	3.00	3.40	1.50	1.80	0.60	1.00	0.25	0.75	0.05	0.45
SMD1210P550SLR	3.00	3.43	2.35	2.80	0.60	1.00	0.25	0.75	0.10	0.50
SMD1210P600SLR	3.00	3.43	2.35	2.80	0.60	1.00	0.25	0.75	0.10	0.50
SMD1210P650SLR	3.00	3.43	2.35	2.80	0.60	1.00	0.25	0.75	0.10	0.50
SMD1210P700SLR	3.00	3.43	2.35	2.80	0.60	1.00	0.25	0.75	0.10	0.50
SMD1210P750SLR	3.00	3.43	2.35	2.80	0.60	1.00	0.25	0.75	0.10	0.50

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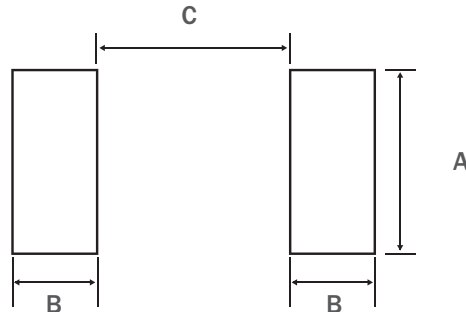
Environmental Specifications

Operating Temperature	-40°C to +85 °C
Maximum Device Surface Temperature in Tripped State	125°C
Thermal Shock	MIL-STD-202 Method 107G +85°C /-40°C 20 times -30% typical resistance change
Solvent Resistance	MIL-STD-202, Method 215 No change
Vibration	MIL-STD-883C, Method 2007.1, Condition A No change
Moisture Sensitivity Level	Level 1, J-STD-020C

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Packaging Quantity and Marking

Recommended Pad Layout (mm.)



Part Number	Marking	Quantity	Solder Pad		
			A	B	C
SMD0402P010SLR		10000	0.70	0.60	0.40
SMD0402P020SLR		10000	0.70	0.60	0.40
SMD0402P035SLR		10000	0.70	0.60	0.40
SMD0402P050SLR		10000	0.70	0.60	0.40
SMD0603P075SLR	N	4000	1.00	1.00	0.80
SMD0603P100SLR	S	4000	1.00	1.00	0.80
SMD0603P150SLR	T	4000	1.00	1.00	0.80
SMD0603P175SLR	V	4000	1.00	1.00	0.80
SMD0805P200SLRT	L	4000	1.50	1.00	1.20
SMD0805P260SLRT	U	4000	1.50	1.00	1.20
SMD0805P300SLRT	X	4000	1.50	1.00	1.20
SMD1206P350SLRT	LC	4000	1.80	1.00	1.80
SMD1206P400SLR	LE	3000	1.80	1.00	1.80
SMD1206P450SLR	LF	3000	1.80	1.00	1.80
SMD1206P500SLR	LK	3000	1.80	1.00	1.80
SMD1210P550SLR	LF	3000	2.50	1.00	2.00
SMD1210P600SLR	LL	3000	2.50	1.00	2.00
SMD1210P650SLR	LJ	3000	2.50	1.00	2.00
SMD1210P700SLR	LN	3000	2.50	1.00	2.00
SMD1210P750SLR	LS	3000	2.50	1.00	2.00

◎ 8 mm tape on 7 inch reel per EIA-481 (equivalent to IEC286, part 3)

Physical Specifications

Terminal Material	Solder-Plated Copper (Solder Material: Matte Tin (Sn))
Lead Solderability	Meets EIA Specification RS186-9E, ANSI/J-STD-002 Category 3.

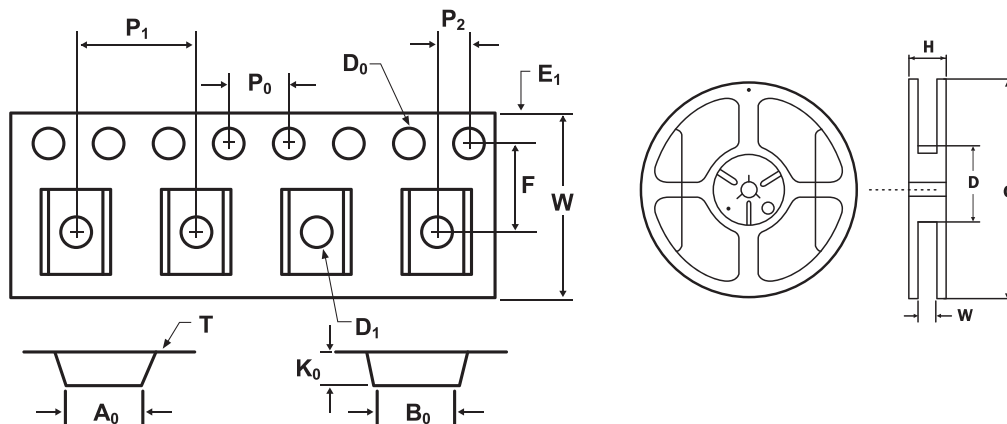
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Tape Specifications: EIA-481 (mm.)

	0402	0603		0805	1206		1210
	P010SLR P020SLR P035SLR P050SLR	P075SLR P100SLR	P150SLR P175SLR	P200SLRT P260SLRT P300SLRT	P300SLRT P350SLRT	P400SLR P450SLR P500SLR	P550SLR P600SLR P650SLR P700SLR P750SLR
W	8.00 ± 0.10	8.00 ± 0.30	8.00 ± 0.30	8.00 ± 0.10	8.20 +0.10/-0.30	8.15 +0.15/-0.30	8.00 ± 0.30
F	3.50 ± 0.05	3.50 ± 0.05	3.50 ± 0.05	3.50 ± 0.05	3.50 ± 0.05	3.50 ± 0.05	3.50 ± 0.05
E₁	1.75 ± 0.05	1.75 ± 0.10	1.75 ± 0.10	1.75 ± 0.10	1.75 ± 0.10	1.75 ± 0.10	1.75 ± 0.10
D₀	1.55 ± 0.05	1.55 ± 0.05	1.55 ± 0.05	1.55 ± 0.05	1.55 ± 0.05	1.55 ± 0.05	1.55 ± 0.05
D₁	—	0.50 ± 0.10	0.50 ± 0.10	1.00 (min)	1.00 ± 0.10	1.00 ± 0.10	1.00 (min)
P₀	4.00 ± 0.10	4.00 ± 0.10	4.00 ± 0.10	4.00 ± 0.08	4.00 ± 0.10	4.00 ± 0.10	4.00 ± 0.10
P₁	2.00 ± 0.05	4.00 ± 0.10	4.00 ± 0.10	4.00 ± 0.10	4.00 ± 0.10	4.00 ± 0.10	4.00 ± 0.10
P₂	2.00 ± 0.05	2.00 ± 0.05	2.00 ± 0.05	2.00 ± 0.05	2.00 ± 0.05	2.00 ± 0.05	2.00 ± 0.05
A₀	0.69 ± 0.03	1.10 ± 0.10	1.10 ± 0.10	1.60 ± 0.10	1.95 ± 0.10	1.92 ± 0.10	2.82 ± 0.10
B₀	1.23 ± 0.03	1.92 ± 0.10	1.92 ± 0.10	2.30 ± 0.10	3.65 ± 0.10	3.65 ± 0.10	3.50 ± 0.10
T	—	0.20 ± 0.10	0.20 ± 0.10	0.25 ± 0.10	0.20 ± 0.10	0.25 ± 0.10	0.20 ± 0.10
K₀	0.60 ± 0.03	0.72 ± 0.10	0.96 ± 0.10	0.90 ± 0.10	0.87 ± 0.10	1.30 ± 0.10	1.30 ± 0.10
Leader min.	390	390	390	390	390	390	390
Trailer min.	160	160	160	160	160	160	160

Reel Dimensions: EIA-481 (mm.)

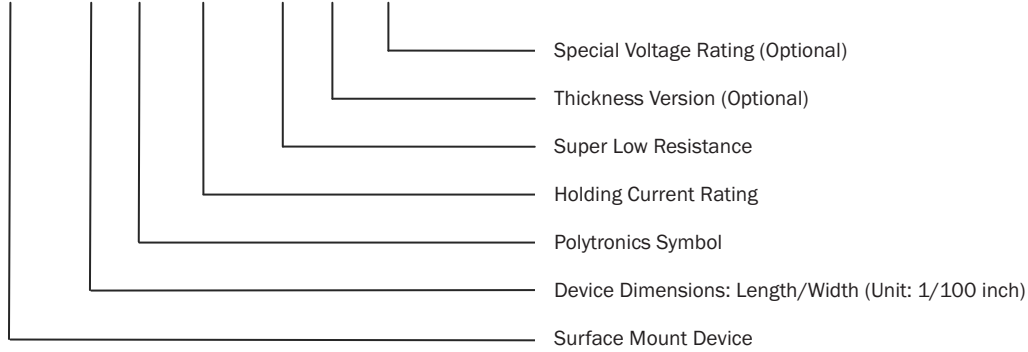
C	Ø178 ± 1.0
D	Ø60.2 ± 0.5
H	11.0 ± 0.5
W	9.0 ± 1.5



SMD SLR Series Surface Mount PTC Devices

Part Number System

SMD 1206 P □□□ SLR T / □□



Cross Reference

Polytronics / EVERFUSE [®]	Cross Reference	
	TE Connectivity / PolySwitch [®]	Bourns / Multifuse [®]
SMD0402P010SLR	-	-
SMD0402P020SLR	-	-
SMD0402P035SLR	-	-
SMD0402P050SLR	-	-
SMD0603P075SLR	-	-
SMD0603P100SLR	-	-
SMD0603P150SLR	-	-
SMD0603P175SLR	-	-
SMD0805P200SLRT	-	-
SMD0805P260SLRT	-	-
SMD0805P300SLRT	-	-
SMD1206P350SLRT	nanoSMD350LR	MF-NSML350
SMD1206P400SLR	-	MF-NSML400
SMD1206P450SLR	-	-
SMD1206P500SLR	NanoSMD500LR	-
SMD1210P550SLR	-	-
SMD1210P600SLR	-	-
SMD1210P650SLR	-	-
SMD1210P700SLR	-	-
SMD1210P750SLR	-	-

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“Multifuse” is a registered trademark of Bourns, Inc.

“PolySwitch” is a registered trademark of TE Connectivity Ltd.